

KIRTLANDIA®

The Cleveland Museum of Natural History

February 1994

Number 48:23-30

PRESENTATION OF THE DAVID S. INGALLS, JR. AWARD FOR EXCELLENCE*

OPENING REMARKS

MARY LOU FERBERT

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Tonight we are assembled to honor Dr. Stephen Jay Gould, who is the recipient of The Cleveland Museum of Natural History's first David S. Ingalls, Jr. Award for Excellence—named for our esteemed past president. The range of Dr. Gould's honorary degrees, fellowships, literary awards, and academic medals is overwhelming. Perhaps it is The Cleveland Museum of Natural History that is being honored tonight by this man's presence. Dr. Gould, it is indeed a privilege and a pleasure to have you here.

I would like to touch briefly on some of the reasons Stephen Jay Gould surfaced so quickly in our survey of candidates for this new award.

Scientific inquiry is a dynamic process that involves questioning, hypothesizing, and re-examining accepted principles — again and again — probing for the truth in the murky haze of evidence we gather in our effort to understand the natural systems of our planet. This is the approach to research of a great scientist. And Dr. Stephen Jay Gould is a great scientist. When he was 31, Dr. Gould, in collaboration with Dr. Niles Eldredge, published "Punctuated Equilibria: An Alternative to Phyletic Gradualism." Their new theory of punctuated equilibrium, proposing that evolution proceeds by a series of fits and starts, was extremely controversial for it challenged the scientific orthodoxy of phyletic gradualism. Eldredge and Gould's theory soon, however, gained prominence.

Questioning is a quality that we wish for in our young

students, for it is controversy that drives the scientific community — both believers and challengers — to dig deeper, to re-evaluate.

Dr. Gould is not just a respected scholar, he is a prolific writer of great wit. I'm sure many in the audience tonight had their curiosity whetted and their minds stimulated by one or more of Dr. Gould's books, essays, or his monthly columns in *Natural History* magazine. At a dinner party within the past month I was delighted to see *Eight Little Piggies*, his newest book, lying on the coffee table. Dr. Gould is a unique writer. He draws subjects from popular culture to illuminate scientific concepts and lightly wraps them in humor. David Fromkin, in the *Washington Post*, comments that Dr. Gould "brings the art of the scientific essay to unparalleled heights."

Dr. Gould is also an ardent baseball fan. I highly recommend his essay "Losing the Edge" for those baseball armchair managers in the audience who have wondered why players don't have 400 averages anymore. His sales in hard and soft cover are in the millions. His writings have been translated in 15 languages, including Italian, Japanese, Spanish, French, Dutch, German, Swedish, Greek, Hebrew, Polish, Czech, and Korean. Now that is a strong worldwide voice.

The Cleveland Museum of Natural History has a long legacy of commitment to education. We were the second

* This award was presented on May 27, 1993 at The Cleveland Museum of Natural History.

science museum in the country to have an education department—and evolution plays a prominent part in the program.

I would like to mention a singular event in an Arkansas courtroom in 1981. The state of Arkansas was trying to pass a law that required the teaching of creationism in the public schools. The disciples of creationism believe that the origin of life as recounted in Genesis is literally true and that evolution is only “theory.” Dr. Gould’s rebuttal included the following, and I quote, “Nonsense. Evolution is as real as gravity. Whether you believe in Newton’s, Einstein’s, or someone else’s explanation of it, the fact is that the apple still falls.” As a result of his testimony, the judge threw out the law. For his role in that court battle, Dr. Gould received *Discover* magazine’s 1981 Scientist of the Year award. We are deeply indebted to you, Dr. Gould, for so many reasons.

The seminal experience that set Dr. Gould’s life’s course was a trip to the American Museum of Natural History with his father at age five where he had his first encounter with *Tyrannosaurus rex*. Perhaps our exhibits will affect some young mind and heart in a similar way, and he or she will be the wonder scientist of the next generation — and maybe challenge your theories, Dr. Gould.

You are an inspiration to us all. You embarked on a life’s search for truth in the field of evolutionary biology and have shared your conclusions through your prolific writings. Because your life has affected so many other lives, The Cleveland Museum of Natural History is pleased to confer upon you the David S. Ingalls, Jr. Award for Excellence.



Stephen Jay Gould, Museum Director J. Mary Taylor, and Norman D. Newell, just after the presentation of The Cleveland Museum of Natural History’s David S. Ingalls, Jr. Award for Excellence.

A SALUTE TO STEPHEN J. GOULD

NORMAN D. NEWELL

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This is my salute to Steve. I am very pleased to be with you and feel you could not have chosen better for your first Cleveland Museum of Natural History Award for Excellence.

Our paths have not crossed often enough since we first met some 35 years ago in New York, but I have followed his career closely and I know him well. Now we are sharing the same platform. Steve would describe this meeting as a matter of chance but I think it may have been foreordained. Now I want to tell you why I think so highly of Steve in his consuming search for an understanding of life and the human condition. Let us try to imagine the rapture that overwhelmed him at five years of age when his father brought him to New York's great American Museum of Natural History. His introduction to the fearsome *Tyrannosaurus rex* was love at first sight. Neither Steve nor the dinosaur would ever again be the same, and it started Steve on a lifetime career into the history of life. Great credit is due his fine teachers at Queens PS 26 and Nathaniel Hawthorne Junior High School.

Later, as a teenager, he and schoolmate Richard Milner (who now works at the natural history museum in New York and is author of the fine *Encyclopedia of Evolution*), participated in science fairs to exhibit and broaden their knowledge of fossils. Remember, this was long before the modern fashion of representing dinosaurs on ties, T-shirts, and picture books for kiddies. In fact, few people outside New York and a few other major cities knew much about dinosaurs. I like to imagine that Steve and Richard started the ball rolling in their generation.

During this period they were frequent visitors to the natural history museum, which had the greatest exhibition of dinosaurs in the world. Steve became thrilled with a vision of nature so unlike his big city, and was challenged by the concept of organic evolution.

I first met him when, as a schoolboy, he came to do some research in my laboratory at the Museum. This seemed normal to me because my own father had introduced me at the age of 10 to the romance of the history of life.

Steve's early interest in the philosophy of science was enhanced by his studies at Antioch College where he obtained his A.B. degree. He later returned to New York for the Ph.D. at Columbia University, and studied evolutionary

biology and paleontology with experts at the American Museum. Steve honors me by calling me his teacher, but my role was primarily to encourage him and to point out promising opportunities. The communication between us was an interchange with mutual benefits, and I continue to learn from his steady stream of publications.

At Harvard University, where he teaches biology, geology, and the history of science, he is exceedingly popular with his regularly oversubscribed classes.

When I asked a neighbor, who had been a humanities student at Harvard some years ago, for his reminiscences, he wrote me the following: "My lecture course with Steve Gould in my freshman year was one of the two or three intellectually most exciting experiences during my entire stay at Harvard (and remember 400 people attended this lecture course; it was not a small intimate discussion group as were the other high points). I can still remember anticipating his lectures with real eagerness."

Steve is both humanist and scientist. As any reader of his *Natural History* magazine columns will know, baseball is his favorite sport and he regularly sings baritone with the Boston Cecilia Choral Group.

His fame extends far beyond the classroom. In abundant broadcasts, publications and popular lectures he fashions a coherent and rational view of the pathways of past and present life. His contributions range through planetary, geological, biological, and social sciences as well as political history, but they are always united by the common thread of evolutionary theory. His works bear such piquant titles as *An Urchin in the Storm*, *The Panda's Thumb* and *Eight Little Piggies*.

Currently, at a time of generally low scientific knowledge, when human distress is spreading over the Earth with the exponential growth of population, Steve is a calming voice of reason. And I believe that the population explosion is the basic cause of much of the world's misery. With homely metaphors and whimsical humor he corrects popular misconceptions about the world in terms that are both entertaining and understandable even to the non-scientist. He does not exaggerate or trivialize scientific concepts.

His prose is friendly, sprinkled with anecdotal asides, and he likes to build from tangential details to broad generalities. He has a gift for startling comments in the service of

his explanations. For example, "My cat may manipulate my psychology, but he'll never play the piano or type a letter."

As a measure of his influence and the public appreciation of his gift, 81 institutions over the world have honored him with their highest awards. These include 34 honorary doctorates of science, humanities and law, an additional 12 literary, and 36 other academic honors.

Besides invited lectures and university teaching, Steve's medium of communication has been popular writing, especially a lively and entertaining monthly article, "This View of Life," in *Natural History* magazine — 209 issues to date. These have been collected in a dozen or so books which have been highly praised by scientific and literary critics.

Fine examples of his extraordinary range and skill are two beautiful coffee table volumes written with celebrated photographer Rosamund Wolff Purcell. These are devoted to historically significant museum collections of artifacts and natural history specimens other than fossils.

His important technical publications, on the other hand, include a large tome on the biological significance of growth changes in animals (*Ontogeny and Phylogeny*) and numerous papers, based on his many days of fieldwork on the mechanics of species splitting in a tropical land snail.

General evolution has occupied much of Steve Gould's career. In my brief comments what can I say? Steve succinctly explains complex scientific principles to general readers. As mechanisms of evolution, he stresses the complex interplay of chance mutations, variability, isolation, natural selection, contingency, and extinction.

He explains the development of ideas since the early days of Linnaeus, Lamarck, Hutton, Lyell and Darwin — leading to our current success in reading the layered crust of the Earth like a history book.

His handling of the history of changing ideas about evolution is informative, leading to Darwin's careful marshalling of evidence and demonstration that evolution has neither purpose nor goal, but results from biological and physical causes.

While reading some of his writings recently, I have been impressed by the way he handles the controversial subject of discontinuities between groups of organisms and fossil sequences. He includes both physical and biological causes for gaps in the stratigraphic record. Some of the greatest gaps correspond to global episodes of mass extinction, suggesting a kind of catastrophism based on natural rather than supernatural causes. The scientific evidence suggests marked climatic and geographic changes and impacts with comets.

The fossil record shows a long succession of bursts of speciation in individual branches, alternating with intervals of stability. In 1972, Niles Eldredge of the American Museum, working with Steve, published on interruptions in the record, calling the phenomenon "punctuated equilibrium." They showed that the stable intervals displayed hardly

any recognizable changes, a condition they called "stasis." Their theory builds on work by Darwin and Ernst Mayr, the great Harvard biologist.

The crucial observation is that changes in organisms are most rapid in small, isolated populations. Islands are notable for generating their own faunas and floras in isolation. According to Eldredge and Gould, the split of a new species from an old one under natural conditions may require a few hundred years. This seems almost instantaneous in geologic time — the "punctuations" of evolution. The speciation event is followed in most, but not all cases, by stasis for millions of years before the organism becomes extinct.

Thus, there is relatively little change within species after initial speciation. Evolutionary trends and higher categories result from a sorting among more and less successful species, and not as a process occurring within single populations. The result is not the conventional tree of life with a central trunk, but a bush of life with radiating limbs and twigs.

After much profitable controversy about this theory, accumulating evidence has produced a favorable consensus. Stasis is easily documented in the fossil record but the "punctuations" are not readily distinguished from non-biological gaps.

Steve is attracted to major issues that require exploration and integration of diverse approaches. These are interdisciplinary exercises which invariably involve differences that can touch the emotions. After all, scientists are human. However, the resulting debates are salutary, and this is the way science advances.

In *Time's Arrow, Time's Cycle*, Gould shows how fossils provide evidence of genealogies. For example, a major group of marine reptiles, the ichthyosaurs, became extinct 75 million years ago. Evidently they were descendants of land dwelling reptiles that returned to the sea. Ichthyosaurs evolved a most uncanny resemblance to fishes, developing a dorsal fin in the proper hydrodynamic position, and a tail fin with two symmetrical lobes. But the ichthyosaurs still retained fundamental signs of their reptilian heritage.

The dorsal fin does not contain the bony supports found in fishes; the vertebral column bends into the lower lobe of the tail, not into the upper, as in fishes; the supports of the flippers are finger bones, not fin rays. In other words, this design was an adaptation to a particular environment. The fish shape is a common adaptation of good design, also seen in mammals such as whales.

Another of Steve's books, a charming one called *Wonderful Life*, deals with early life and its bearing on humanity. Intensive ongoing searches in Precambrian rocks show that already diverse one-celled organisms existed on Earth at least 3.5 billion years ago. Many-celled plants and animals did not appear until after more than three-quarters of the known history of life. An inference from this long delay is that, while simple life on Earth may have been

inevitable, complex life was not. There is a lesson here for seekers of intelligent civilizations elsewhere in the universe!

He tells of a remarkable assemblage of fossil marine animals more than one-half billion years old in the Canadian Rockies (the Cambrian Burgess Shale fauna). Most of the fossils are unlike any other animals known to science. They arose from unknown ancestors and shortly became extinct without descendants, save for a primitive shrimplike form and a wormlike animal with a basic anatomical feature that allies it with the major animal division to which we belong (Chordata).

Steve cites this unique assemblage of animals as an example of the chaotic events of evolution, whose details are chancy and contingent on preceding events. There is no obvious explanation why a tiny wormlike creature, our own probable ancestor, should have survived while most of the odd types disappeared without descendants. This was evidently an early experiment that failed, probably because of some environmental accident. Had conditions been slightly different and the Burgess "worm" had died out with the others, we, you and I, would never have appeared.

Another of Steve's eyeopeners concerns the long association of dinosaurs and mammals, for 135 million years, through most of the Mesozoic Era. The diverse mammals of that time were very small, inoffensive creatures that could not compete effectively with the dinosaurs that had pre-empted almost every ecological niche. Immediately after the mass extinction of the dinosaurs, the mammals underwent a major radiation eventually leading to our own lineage. Clearly, they had been repressed by the dinosaurs. From this we may infer that we owe our very existence to the disappearance of the dinosaurs.

Scientists must, of course, be morally responsible; and Steve has always been deeply concerned with the immorality of prejudice, especially racial prejudice. This prompted his study of IQ intelligence tests. In 1912, H. H. Goddard was the popularizer of the IQ scale, which he considered to be an accurate measure of innate intelligence. He graded people by traits which he thought were inheritable, arguing that underprivileged people were usually low on the scale because of inferior intelligence. This pernicious idea is still prevalent.

In 1969 William Jensen expanded the notion to cover inferior and superior genes and made it a public issue. Compensatory education failed, he said, because the black children it attempts to aid are genetically inferior in intelligence to white children. Steve brings biological principles to bear on this problem. He points out that modern geneticists consider variation within and between groups as two entirely different phenomena. The differences in IQ between groups have complex causes, mainly because of differences in environmental opportunities. On the other hand, there are usually significant genetical differences between individuals within single family groups.

Skills are acquired by training, not by inheritance. Black and brown people achieve high attainments in all fields: the arts, government, athletics, etc., wherever opportunities permit. In his book, *An Urchin in the Storm*, Steve maintains that as long as teachers and national leaders act upon the belief that intelligence is fixed in particular genes, human potentials will be sacrificed.

Stephen J. Gould is a great educator, attracted by issues that require research and integration; he is profound in his exploration and tries to be fair in his treatment of opponents. Behind that friendly cherubic countenance, however, there is a sleeping tiger. It was inevitable for him to lead in challenging the anti-intellectual politics of the religious right. This is not a new problem. In 1896, Andrew Dickson White, president of Cornell University, published a two-volume work, *Warfare of Science with Theology*.

Steve quotes White, a devout Christian, about the conflict: "Interference with science in the supposed interest of religion, no matter how conscientious such interference may have been, has resulted in the direst evils both to religion and to science; on the other hand, all untrammelled scientific investigation, no matter how dangerous to religion some of its stages seemed to have been, has invariably resulted in the highest good both for religion and for science" (White, 1896, p. viii). Let me stress, this was written in 1896, at the height of an anti-Darwinian furor.

In the 1920s, the previously quiet fundamentalist movement abruptly became an aggressive evangelistic crusade. It was based on the fear that children were being taught to deny God and the Bible, reject family values, and fashion their morality on what they called "Social Darwinism." In many states, statutes were enacted to prohibit the teaching of organic evolution in the schools or, as a compromise, to give equal attention to biblical creation whenever evolution was discussed.

Many years passed before these state laws were struck down by district courts, with Steve's help. Finally, in 1987, the Supreme Court decreed that "creation science" is not science. This ruling, however, turned out to be only a minor victory for science.

Fundamentalists have their own schools where they are free to stress biblical creation as literal truth in every detail. They have, more recently, become an organized political power supporting their own candidates for public office.

Steve feels religion has the supreme mission of promoting morality, ethics and the Golden Rule. However, judgments about biology, geology, and scientific cosmology require special knowledge not possessed by most theologians. His ire is aroused by attacks on science education by the religious right. Knowing the Bible well, he effectively and firmly refutes their narrow interpretations.

Steve Gould enjoys dissecting and challenging dogma and outmoded concepts in the interest of truth. In debates, he is confronted by vernacular use of some common words

such as "facts," "truth," "evidence," "theory" and "proof," all of which frequently mean different things to scientists and laymen. He is careful to define his terms.

The word "theory" is an example. It has two meanings. To the general public it usually means something that is speculative; to the scientist it is a concept based on firm evidence. The theory of evolution is based on verifiable observations. The so-called "theory of special creation" has no objective support. It is a hypothesis, a belief or fantasy.

Gallup Polls in 1987 and 1992 reported that almost one-half of the United States population believes in a universe created miraculously only a few thousand years ago, and tenanted only by the living species that survived Noah's flood.

The literal belief in the book of Genesis now commands a growing audience greater than at any time since Darwin. At prime time one February evening, CBS television showed a two-hour documentary film describing the "amazing discovery of the Ark on Mount Ararat." I wonder if any of you saw it? It was certainly no credit to CBS!

It is our way to be suspicious of changes that challenge our beliefs. For more than four generations, millions of poorly informed religious conservatives have regarded Darwinism and evolution as an evil threat to their faith and to their way of life. But in spite of their spokesmen, evolution is, indeed, a fact. It is a tragedy that they choose peace of mind over the scientific truth.

Why do people find evolution uncomfortable? Carl Sagan has put this well when he asks if we should accept a comfortable lie, or embrace the uncomfortable truth. I was nonplussed to be told not long ago, at the end of a general lecture on evolution, "I don't care if what you say is true, I don't wish to believe it. I find comfort in my religion, not from science."

Widespread public ignorance of the historical sciences of biology, geology and astronomy fuels fundamentalism. As Gould says in *Wonderful Life*: "History, with its quirky pathways and quixotic reorganizations teaches a hard lesson. Unless God is even more inscrutable than we ever dared to imagine (or unless He explicitly designed our modes of thought so that we would never grasp His own), the history of life confers no special or preordered status on human intelligence. Life's history is massively contingent — usually dependent — on particulars of history, quite unpredictable and unrepeatable. They divert futures into new channels, shallow and adjacent to old pathways at first (like the twigs of a bush), but deepening and diverging with the passage of time.

"If we could play the game of life again, history would roll down another set of utterly different but equally explainable channels. If life's history cannot be read as an ascending ladder to human wisdom, step after predictable step, neither can the opposite pole of true randomness capture its evident order." In other words, if there is any biological order in nature, it is based on both natural selection and chance, not on plan and purpose.

Steve straightens out popular misconceptions, and helps the non-scientist understand the historical sciences and how nature works. If everyone down through history had lacked curiosity about the universe, there would be no basic science, no technology, no heavy industry, no medicine, and we would be living in caves with population numbers of only a few million rather than the present teeming billions.

We are here tonight to celebrate the gifts of an extraordinarily talented individual of strong motivations and great stamina. He has influenced very many people, students and general public alike, through his life and his work. His enthusiasm is infectious, and his remarkable ability to teach and express himself are rare qualities to be treasured.

Stephen J. Gould, our thanks and congratulations. But remember, at your mid-career, there is still much work for you to do!

Books by Stephen Jay Gould

(Published by W. W. Norton & Company, New York and London, unless otherwise noted.)

- Ontogeny and Phylogeny*. 1977. Harvard University Press
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- An Urchin in the Storm*. 1987.
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- Illuminations* (with R. W. Purcell). 1986.
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- Eight Little Piggies*. 1993.

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REPLY

STEPHEN JAY GOULD
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I have dedicated two of my books to teachers. One of my most recent, *Wonderful Life*, honors the man who introduced me tonight: "To Norman D. Newell, who was, and is, in the most noble word of all human speech, my teacher. (I conducted a little internal debate between "parent" and "teacher" for the designation of "most noble word," but decided on the latter as a relationship of choice rather than, at least in one direction, necessity.) One of my earliest books, *The Panda's Thumb*, honors three of my primary school teachers with a quote from Henry Adams: "A teacher... can never tell where his influence stops."

Did you have any inkling, Norman, when you received that bratty letter from a teenaged kid looking for a Westinghouse science project for the high school fair, that both of us, as members of the AARP nearly forty years later, would be celebrating so many years of mentorship and collegiality? A teacher can never tell where his influence stops. *Verbum dei manet in aeternum. Deus* (God) is *dominus* (lord); *dominus* (lord) is don (teacher). So the line does apply to you, and you shall always be the strongest influence upon my professional life. For that precious gift, there are no words — except to acknowledge you as my teacher.

But the happy coincidence of your presence in one of the nation's great natural history museums does allow me to make a crucial point about our common calling, and our commitment to the study of life and its history. Diversity is nature's distinctive calling card — her pervasive empirical theme and the result of the principles (natural selection and other components of evolutionary theory) that regulate life's history. Vicarious and virtual illustrations have their limits. Pictures and flashing lights may capture our fancy, but only authentic objects of nature can fully stir both our souls and our intellects. The natural history museum — with its focus on collecting and displaying life's rich diversity — must therefore be the institution of choice for students of this most fascinating of all biological subjects.

Yet, we all feel an ebbing of support from both public and professional domains — professional, as academic biology moves ever so strongly to a molecular beat (so far so good) and tragically casts aside (now becoming bad in lamentable shortsightedness) the study of whole organisms as a superannuated mode of inquiry; and public, as the glitz of "theme park" museums (and their contentless gift-shop



Stephen Jay Gould grasping the bronze sculpture given as a symbol of the David S. Ingalls, Jr. Award for Excellence. The sculpture, "Kneedeep," was a playful attempt by sculptor and Museum assistant director Laurence G. Isard to capture a moment of awkward grace in a frog's attempt to reach new heights.

paraphernalia) threaten to beat the substance of nature's real objects into a secondary and neglected status.

We must fight back, and the battle is far from hopeless. Disney's forthcoming history theme park in Virginia may draw more people than the Gettysburg battle site, but Gettysburg remains thronged with passionately fascinated people. Natural history museums need not outcompete MTV; they simply must be chock full of people who love science and the living world — and such people exist in more than adequate numbers.

I focus upon the conjunction of Norman Newell, a great museum paleontologist, with The Cleveland Museum of Natural History, a grand museum of its genre, because these two facets of our shared professional life represent what we must retain if we are to survive with integrity. Great museums must be places of active research, not merely static display. If the public exhibits are the entirety, and not the tip of an iceberg formed by study specimens in drawers, material just collected and ready for cataloguing, and, above all, the hum of curators and researchers engaged in formulating new knowledge about natural history, then the institution will have no dynamic foundation, and will eventually die. The public often doesn't even know that research and publication form the backbone of all great museums — and we should advertise this function more openly, and with pride. Norman Newell, one of the world's greatest paleontologists,

has spent his career at the American Museum of Natural History in New York. He stands for the best of this too invisible tradition.

The Cleveland Museum represents one of a diminishing number of great institutions — New York, Harvard, Yale, Chicago, Philadelphia, Pittsburgh, and San Francisco also come prominently to mind — committed to the old ideal of displaying nature's diversity through stunning and instructive specimens. There will never be any substitute for authenticity, no matter how close virtual reality comes to the actual, and no matter how exciting the lights and motion of theme parks can become. So long as real objects continue to stir us, our humanity will be intact and our ties to the earth that made and nurtured us will prosper. Long may the great museums of nature's diversity flourish.



Ferbert, Mary Lou, Newell, Norman D., and Gould, Stephen Jay. 1994.
"Presentation of the David S. Ingalls, Jr. Award for Excellence to Stephen Jay Gould." *Kirtlandia* 48, 23–30.

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